RBCDH Brazilian Journal of KINANTHROPOMETRY and Human Performance

DOI: http://dx.doi.org/10.5007/1980-0037.2012v14n4p439

original article

Judging criteria in international professional surfing championships

Critérios de julgamento em campeonatos internacionais de surfe profissional

Rosemeri Peirão[1]
Saray Giovana dos Santos[1]

Abstract – This study investigated the association between judges' scores and the variables that represent judging criteria of surfing events. A total of 164 waves ridden by 21 international surfers were recorded and analyzed in two stages of the Brazilian ASP World Tour (2007 and 2010). The following tests were used for descriptive analysis of data: the Kolmogorov-Smirnov and the Student t test, one-way ANOVA, the Tukey post-hoc test and Pearson correlation analysis ($p \leq 0.05$). Significant differences were found between the scores of waves with bad, average and exceptional take-offs ($p \leq 0.05$) and with controlled exit, fall in the main section of the wave (MSW) and after the MSW ($p \leq 0.001$). There was a significant correlation ($p \leq 0.05$) between wave scores and the following variables: frequency of imbalance in the maneuvers (r=-0.30), percentage of maneuvers in the critical section of the wave (r=0.68), variety of maneuvers (r=0.62), frequency of carving (r=0.51), re-entry (r=0.43), floater (r=0.23) and cut-back (r=0.27) maneuvers, length of ride (r=0.76) and total frequency of maneuvers (r=0.79) for the ASP World Tour 2007; percentage of maneuvers in the critical section of the wave (r=0.34), variety of maneuvers (r=0.70), frequency of carving (r=0.46), re-entry (r=0.51), cut-back (r=0.30) and aerial maneuvers (r=0.30), length of ride (r=0.71) and total frequency of maneuvers (r=0.75) for the ASP World Tour 2010. The results showed that all surfing criteria used by judges in this study correlated significantly with scores in the ASP World Tour 2007 and 2010, except for frequency of imbalances in the second competition.

Key words: Athletic performance; Judgment; Sports.

Resumo – *Este estudo objetivou verificar a relação entre as notas dos árbitros com variáveis representantes dos critérios de julgamento do surfe. Para tanto, foram filmadas e analisadas 164 ondas surfadas por 21 atletas em duas etapas brasileiras do ASP World Tour (2007 e 2010). Foram utilizados a estatística descritiva e os testes de Kolmogorov Smirnov, teste 't' de Student, Anova (one-way), Post Hoc de Tukey e Pearson ($p \leq 0,05$). Foram observadas diferenças significativas entre as notas das ondas com dropes ruins, bons e excepcionais ($p \leq 0,05$), e entre as notas das ondas finalizadas de maneira controlada, com queda na principal seção da onda (PSO), e com queda após a PSO ($p \leq 0,001$). Foi observada correlação significativa ($p \leq 0,05$) entre a nota e as variáveis: frequência de desequilíbrio (r=-0,30), percentual de manobras realizadas na parte crítica da onda (r=0,68), variedade de manobra (r=0,62), frequência das manobras rasgada (r=0,51), batida (r=0,43), floater (r=0,23) e cut-back (r=0,27), duração da onda (r=0,76) e frequência total de manobras (r=0,79) para o ASP World Tour 2007; percentual de manobras realizadas na parte crítica da onda (r=0,34), variedade de manobra (r=0,70), frequência das manobras rasgada (r=0,46), batida (r=0,51), cut-back (r=0,30) e aéreo (r=0,30), duração da onda (r=0,71) e frequência total de manobras (r=0,75) para o ASP World Tour 2010. Os resultados permitiram concluir que todos os critérios utilizados pelos árbitros avaliados neste estudo se correlacionaram significativamente com as notas no ASP World Tour 2007 e 2010, com exceção da frequência de desequilíbrios na segunda competição.*

Palavras-chave: *Desempenho esportivo; Esportes; Julgamento.*

1 Universidade Federal de Santa Catarina. Laboratório de Biomecânica. Florianópolis, SC, Brasil.

Received: 16 May 2011
Accepted: 22 October 11

INTRODUCTION

Surfing is currently practiced in many countries, but it a more advanced competition sport in Australia, Brazil and the United States[1]. The technical development of this sport has raised the need to conduct scientific studies both in the field of equipment and to investigate the science of surfing. However, the judgment of athlete performances has always been the greatest problem during competitions.

Human judgment, by means of observation, may be defined as subjective because of the social and psychological influences to which the judges are exposed. Currently, the judgment criteria in most esthetic sports are limited, and few objective measurements justify the scores assigned by judges[2].

Differently from sports that evaluate athlete performance according to objective measures, such as time, distance or height, esthetic sports rely on the subjective evaluation of a judging panel, which involves human judgment. Therefore, although judgment criteria may be described in details, several factors may affect scoring[2]. Sports such as gymnastics, figure skating, diving and surfing, for example, in which performance has measureable aspects, are often the focus of studies to identify how to best judge them.

Many authors believe that the first step to reduce judgment subjectivity is the simplification of judgment criteria presented to judges[2-7]. This study evaluated the association between the scores assigned by judges and variables that are representative of judging criteria in surfing competitions according to the Association of Surfing Professionals (ASP) in international professional surfing competitions.

METHODS

Sample

This correlational descriptive study evaluated 164 waves surfed by 21 international athletes in two rounds of the ASP Men's World Tour in Brazil (2007 and 2010) in Vila Beach, Imbituba, Brazil. In the two events, athletes from France, Australia, Hawaii, United States, Brazil, Portugal, South Africa and Tahiti represented their countries. This study was approved by the Committee on Ethics in Research with Human Beings of the Universidade Federal de Santa Catarina, Brazil, under no. 277/2009.

The last 15 heats of each round (rounds of 16, quarterfinals, semifinals and finals) were selected by convenience sampling. One surfer of the two in each heat was selected randomly according to the shirt color (red or yellow); that is, in the first heat that was filmed, the surfer wearing the yellow shirt was selected, in the second heat, the one wearing the red shirt, and so on, alternating the color of the shirt until the end of the competition.

Instruments

The ASP Rule Book[8] was used to identify the judging criteria used by the judges when assigning scores in international surfing competitions, and an experienced surfing judge (instructor in the International Judging and Officiating Courses of the International Surfing Association [ISA]) was interviewed. The main judging criteria used by the surfing judges were: perform maneuvers in the critical section of the wave; perform major maneuvers; perform innovative and progressive maneuvers; variety of maneuvers; speed, power and flow; high quality take-off; control during performance; and controlled wave exit.

To record the images of surfers during competition heats, two digital cameras (Sony® MVR-V1U and Panasonic® PV-GS120; 30hz) and a tripod were used. The scores of the waves surfed, assigned by the judges, were obtained from a database available in the on-line[9,10].

Study variables

The score (0.1 to 10.0) for each wave surfed by the athletes and selected for the study was the mean score assigned by three of the five judges, as the highest and lowest scores are excluded.

The other study variables were defined according to the ASP judging criteria: take-off quality (exceptional, average or bad), wave exit (controlled, fall in the main section of the wave [MSW] or after the MSW); frequency of imbalances (IF), percentage of maneuvers in the critical section of the wave (MCS); variety of maneuvers (VIM); and frequency of each major maneuver:

- Carving: sharp turn in steep wave face.
- Re-entry: turn in the lip and re-entry of the wave face after contact with the crest or breaking wave;
- Floater: the surfing board angles up the breaking wave and rides laterally before dropping back onto the wave face;
- Cut-back: the surfer rides up the wave shoulder, turns back towards the breaking part of the wave without losing speed and ends with a re-entry in the critical section of the wave;
- Three-sixty: one single rotation at the top in the natural direction; called three-sixty because a full rotation (360 degrees) is performed, and the surfer may ride toward the breaking wave;
- Tube: surfing along the surface of a breaking wave between the lip and the face, inside the hollow barreling part of the wave.
- Aerial: the surfer uses the wave face as a ramp and launches into the air off the top of a wave and rotates in the air before dropping back down into the same wave.

The other study variables, not representative of the ASP judging criteria, were: position of the surfer on the board in relation to the wave (SPEW) (frontside: when the surfer faces the wave; or backside: when the back of

the surfer is turned to the wave); length of ride; and overall frequency of major maneuvers (FM).

Data collection

Data were collected (image recordings) with a camera positioned to capture the individual image of the surfer during all the heat (about three meters above sea level and 75 to 100 meters from the athlete). During recordings, the maximum zoom level was used. Fifteen 30-minute heats were filmed in each round, except that the last heats lasted 35 minutes. Only one surfer was filmed in each heat.

Statistical analysis

Descriptive statistics was used to analyze data, and the Kolmogorov-Smirnov test was used to test data normality. According to data distribution, the following parametric tests were used: the Student *t* test for independent samples, to compare wave scores in the categories of the SPEW variable (frontside; backside); one-way ANOVA followed by the Tukey post-hoc test, to compare wave scores in the categories of take-off quality and wave exit; the Pearson correlation test, to test the association between scores and IF, MCS, VIM, frequency of each maneuver, length of ride and FM. The level of significance was set at 5% for all tests.

RESULTS

Table 1 shows the descriptive values of the quantitative variables under study. FM was 3.0 to 3.6 per wave in the 2007 and 2010 ASP World Tour (ASP WT).

Table 1. Mean (SD), minimum and maximum scores assigned by judges and variables that characterize the waves under analysis in the heats of two Brazilian rounds of the Association of Surfing Professionals (ASP) World Tour (WT)

Variables	ASP WT	
	2007	2010
	Mean ± SD Min – Max	Mean ± SD Min – Max
Score	4.4 ± 2.7 0.4 – 9.1	4.1 ± 2.4 0.5 – 9.0
IF (n)	0.59 ± 0.73 0 – 3	0.70 ± 0.72 0 – 3
MCS (%)	83.3 ± 28.1 0 – 100	88.4 ± 26.7 0 – 100
Length of ride (s)	13.9 ± 6.6 2.0 – 27.0	14.9 ± 9.1 3.0 – 42.0
FM (n)	3.0 ± 1.9 0 – 7	3.6 ± 2.4 0 – 10
VIM (n)	1.8 ± 1.0 0 – 4	2.3 ± 1.2 0 – 5

IF: Frequency of imbalances; MCS: Maneuvers in the critical section of the wave; FM: frequency of maneuvers; VIM: variety of maneuvers.

Table 2 shows the descriptive values of the qualitative variables under study. In over 50% of the waves surfed in the two rounds, take-off quality was classified as average, and wave exits were controlled.

Table 2. Frequency of take-offs, exits and SPEW in the heats of two Brazilian rounds of the Association of Surfing Professionals (ASP) World Tour (WT)

Categorical variables	ASP WT			
	2007		2010	
	n	%	n	%
Take-off				
Bad	7	8.4	2	2.5
Average	61	73.5	72	88.9
Exceptional	15	18.1	7	8.6
Exit				
Fall in MSW	20	24.1	21	25.9
Fall after MSW	11	13.3	14	17.3
Controlled exit	52	62.7	46	56.8
SPEW				
Frontside	57	68.7	42	51.9
Backside	26	31.3	39	48.1

MSW: main section of the wave; SPEW: position of the surfer on the board in relation to the wave (SPEW); frontside: facing the wave while surfing; backside: surfing with the back to the wave.

Table 3 shows the frequency of major maneuvers performed by surfers. Together, carving and re-entries accounted for more than 50% of the maneuvers performed by the athletes during the two competitions.

Table 3. Frequency of maneuvers performed by surfers in the heats of two Brazilian rounds of the Association of Surfing Professionals (ASP) World Tour (WT)

Maneuvers	ASP WT			
	2007		2010	
	n	%	n	%
Carving	79	31.7	85	27.1
Re-entry	95	38.2	109	34.7
Floater	22	8.8	20	6.4
Cut-back	41	16.5	41	13.1
Three-sixty	3	1.2	7	2.2
Aerial	4	1.6	26	8.3
Tube	1	0.4	0	0.0
Total	249	100	314	100

The variables representative of the judging criteria analyzed in this study were correlated with the scores assigned by the judges, and the results are shown in Tables 4 and 5.

According to Table 4, the waves with bad take-offs had lower scores than the waves with average and exceptional take-offs in ASP WT 2007, and the average take-offs had lower scores than the waves with exceptional

take-offs, whereas in ASP WT 2010, the waves with bad take-offs had lower scores than the waves with exceptional take-offs. In both competitions, the waves with fall in MSW had lower scores than those with controlled exits or falls after MSW.

Table 4. Comparisons of scores (Mean ± SD) between the categories of variables: take-off quality and wave exit in the heats of two Brazilian rounds of the Association of Surfing Professionals (ASP) World Tour (WT)

Categorical variables	ASP WT			
	2007		2010	
Take-off	Mean ± SD	p†	Mean ± SD	p†
Bad	1.9 ± 2.4[a]		2.9 ± 3.3[a]	
Average	4.2 ± 2.6[b]	<0.001	3.9 ± 2.3[ab]	0.006
Exceptional	6.6 ± 1.7[c]		6.7 ± 2.3[b]	
Exit				
Fall in MSW	1.8 ± 1.4[a]		1.9 ± 1.0[a]	
Fall after MSW	4.8 ± 1.9[b]	<0.001	4.9 ± 2.0[b]	<0.001
Controlled exit	5.3 ± 2.6[b]		4.9 ± 2.4[b]	

MSW: main section of the wave; † one-way ANOVA; Tukey post-hoc test; results followed by the same letter in the columns are not significantly different at the pre-determine confidence interval

Table 5. Correlation between scores and variables (IF, MCS, VIM and frequency of each maneuver) that characterized the waves surfed in the heats of two Brazilian rounds of the Association of Surfing Professionals (ASP) World Tour (WT)

Variables	ASP WT	
	2007	2010
	r	r
IF (n)	-0.30*	-0.13
MCS (%)	0.68**	0.34*
VIM (n)	0.62**	0.70**
Carving FM	0.51**	0.46**
Re-entry FM	0.43**	0.51**
Floater FM	0.23*	0.11
Cut-back FM	0.27*	0.30*
Three-sixty FM	0.20	0.03
Aerial FM	-0.07	0.30**

IF: Frequency of imbalances; MCS: maneuvers in the critical section of the wave; VIM: variety of maneuvers; FM: frequency of maneuver;
*p≤0.05; **p≤0.001.

According to results shown in Table 5, the scores assigned by the judges increased as IF decreased and MCS and VIM increased.

The other variables analyzed in this study, that is, those that, although not representative of judging criteria in surfing, are characteristics of waves surfed, are SPEW, length of ride and FM. Their results showed that there were no significant differences between frontside and backside surfing in ASP WT 2007 (4.5 ± 2.7 vs. 4.1 ± 2.5; p=0.536) or ASP WT 2010 (3.9 ± 2.7 vs. 4.3 ± 2.1; p=0.464); the longer the time the surfer remained in the wave,

the higher the score assigned by the judges in the ASP WT 2007 ($r=0.76$; $p<0.001$) and ASP WT 2010 ($r=0.71$; $p<0.001$); and the higher the FM in a wave, the higher the score assigned by the judges in the ASP WT 2007 ($r=0.79$; $p<0.001$) and ASP WT 2010 ($r=0.75$; $p<0.001$);

DISCUSSION

The first maneuver evaluated by the judges is the take-off. According to the results reported here, the scores assigned by judges increased with the quality of take-off in the two competitions (Table 4).

Lowdon et al.[3] used a different method and found that take-off quality did not affect scores assigned by judges. Their results might be explained by the fact they used a different method, as they divided take-offs of different levels of quality (good, average and exceptional) according to the surfer's position on the board (frontside or backside), which resulted in six different categories. They later correlated these maneuvers and the judges' scores. As only one of these maneuvers was performed in each wave, their frequency was very low when compared with that of the other maneuvers performed by surfers, and this may explain their low correlation with the judges' scores.

The last task for the surfer is to perform a good wave exit, and an uncontrolled exit (loss of balance and fall) is negatively correlated with judges' scores, according to the study conducted by Lowdon et al.[3]. Their result was confirmed in our study, as we found that the waves with falls in MSW had lower scores than those with controlled exits or falls after MSW. According to *Mendez-Villanueva et al.*[11], fatigue induced by paddling may be associated with negative effects on postural control and performance during the maneuvers and, consequently, the surfer's fall. Therefore, aerobic aptitude, resistance and muscle force may be significant components of a successful training program for surfers[12].

The analysis of other results revealed a mean number of three imbalances for each five waves in the ASP WT 2007 and two for each three waves in the ASP WT 2010. Both Frank et al.[13] and Chapman et al.[14] found that surfers had better balance indices than non-surfers because of the maneuvers that have to be performed in a dynamic environment, full of visual, somatosensory and vestibular information[14]. Maneuver control is part of the criteria to judge surfers in competitions, as well as in most esthetic sports, which may be confirmed by the results of our study, where the lower the number of imbalances, the higher the score assigned by judges in the ASP WT 2007.

Judging surfing has focused on the quality of the maneuvers performed and, since the late 1980s, on the fact that these maneuvers should be performed in the most critical section of the wave, the part of the wave with the greatest energy to propel the athlete[8]. In our study, 83 and 88 of each 100 maneuvers were performed in the critical section of the wave in the ASP WT 2007 and 2020 (Table 1). The judges' scores increased as the

number of maneuvers performed in the critical section of the wave also increased (Table 5).

While surfing, the performance of the maneuvers is the surfer's main objective, and the types of maneuvers performed will depend on the athlete's level of ability and the wave characteristics[15]. During competitions, maneuvers performed by surfers are evaluated according to quality and variety[8], as demonstrated in this study, in which we found that the score assigned by the judges increased with the variety of major maneuvers performed in a wave (Table 5).

In surfing, new maneuvers or variations of the existing maneuvers are often created, particularly due to technological advances in the manufacture of boards and accessories. Moreira[16] identified 110 different surfing maneuvers. However, our study evaluated only major maneuvers, that is, those that are expected to have a greater impact in judges' scores.

In the ASP WT 2007, the aerial maneuver was not performed as frequently as in the ASP WT 2010, which may probably be explained by the large waves seen in 2007. Aerial maneuvers and their variations, under those sea conditions, would be too dangerous to perform, differently from what was seen in 2010. In addition, other wave characteristics described by Scarfe et al.[15] may also affect results: peel angle, which determines the surfer's speed and, therefore, increases the chance of performing an aerial maneuver at the moment when the speed is higher; breaking intensity, which is defined as the ratio of wave height to vortex width (cubic curve of the tube), should be neither low nor too high for the performance of an aerial maneuver. A low ratio does not provide enough impulse and speed for the surfer to jump, whereas a high breaking intensity decreases surfer's control of the board and increases the risk of falling, which, in turn, may decrease the scoring potential, depending on which section it occurs.

Beaches such as Pipeline (Hawaii, US) produce perfect waves for barreling, differently from Vila Beach, in Imbituba, Brazil, where waves have a low vortex ratio. Our results showed that the tube was the major maneuver that had the lowest frequency in the heats selected (one in ASP WT 2007 and zero in 2010). In contrast, carvings and re-entries were the maneuvers most often performed in the two competitions because the characteristics of the beach were ideal for them. This study results confirm and show that, in ASP WT 2007, the maneuvers that had a significant correlation with the judges' scores, in decreasing order of *r*, were: carving, re-entry, cut-back and floater. In ASP WT 2010, they were: re-entry, carving, aerial and cut-back (Table 5).

Lowdon et al.[3], in a study to evaluate the maneuvers with the greatest correlation with the judges' scores in professional competitions (506 waves), found that most major maneuvers, that is, those that have the potential to receive a high score, were rarely used. According to those authors, either the judges did not fully score the waves in which the major maneuvers were performed, or the maneuvers were not radical (high quality) enough to affect the judges' scores.

The performance of a backside take-off is much more difficult than a frontside maneuver. The chances of falling during a backside take-off are greater because surfing with the back to the wave while carving increases the potential to lose body balance, which does not happen in frontside take-offs. However, our study did not find any significant differences between the scores for frontside and backside maneuvers in either competition.

The percentages of time in each maneuver performed by the surfers in a competition heat may vary, particularly due to environmental factors, bathymetric features (ocean depth) and the type of bottom (sand, reefs or rocks)[1]. Mendez-Villanueva et al.[11] and Palmeira[17] found that mean riding time was 11.6 s (1-44s) and 11.0 s. Our study found similar times (13.±6.6 *s* and 14.9±9.1 s in 2007 and 2010). However, Lowdon et al.[3] found mean times of 23.7 s (241 waves) and 23.0 s (265 waves) in two competitions. Their high values may be explained by the local bathymetric features (type of bottom at surfing peak) and as a consequence of advances in surfing and in judging criteria. At the time their study was conducted, the surfers that performed the most radical and controlled maneuvers for the longest distance had the highest scores[3]. Lowdon et al.[3] found that riding time was the main determinant of judges' scores in the two events recorded (r=0.89 and r=0.81).

Although riding time is no longer one of the ASP judging criteria, in the study conducted by Palmeira[17] (r=0.57; p<0.005) and in our study (ASP WT 2007: r=0.76; p<0.001; ASP WT 2010: r=0.71; p<0.001), scores were higher as riding times increased. Surfers have to ride the wave for a certain length of time to be able to perform a variety of maneuvers and demonstrate innovative and progressive surfing and to be promoted into the next phase of the competition.

Although surfing judges are instructed to score a wave not according to the number of maneuvers performed, but, rather, the quality and variety of maneuvers, the results of our study showed that scores increased with higher numbers of major maneuvers performed in a wave. Riding time and frequency of maneuvers, although not included in the list of judging criteria, have an indirect effect on judges' scores.

One of the limitations of this study was the lack of other cameras, as only one was used, and of cameras of higher quality (more frames per second), which would have allowed us to film two surfers in each heat, obtain better images and have a larger study sample (number of waves). Despite these limitations, the information generated is original, as no similar findings have been found in Brazilian literature or in recent international studies.

CONCLUSIONS

According to the study objectives, our results demonstrated that the variables that represent the ASP judging criteria for surfing, evaluated

in this study, had a significant correlation with the scores assigned by judges in the ASP WT 2007. In the ASP WT 2010, all criteria correlated with scores significantly, except maneuver control (frequency of imbalances). These findings confirm that judges have been using the ASP judging criteria.

In conclusion, wave riding time and frequency of maneuvers are variables that affect judges' scores indirectly.

REFERENCES

1. Mendez-Villanueva A, Bishop D. Physiological Aspects of Surfboard Riding Performance. Sports Med 2006;35(1):55-70.
2. Auweele YV, Boen F, Geest A, Feys J. Judging Bias in Synchronized Swimming: Open Feedback Leads to Nonperformance-Based Conformity. J Sport Exerc Psychol 2004;26:561-71.
3. Lowdon BJ, Patrick J, Ross K. Manoeuvres Used and Judges' Scores in an International Surfing Contest. Summary Report. Belconnen, ACT: Australian Sports Commission, 1996.
4. Balmer NJ, Nevill AM, Williams AM. Modelling home advantage in the Summer Olympic Games. J Sports Sci 2003;21:469-78.
5. Zitzewitz, E. Nationalism in Winter Sports Judging and Its Lessons for Organizational Decision Making. J Econ Manag Strategy 2006;15(1):67-99.
6. Boen F, Auweele IV, Claes E, Feys J, Cuypera B. The impact of open feedback on conformity among judges in rope skipping. Psychol Sport Exerc 2006;7:577-90.
7. Plessner H, Haar T. Sports performance judgments from a social cognitive perspective. Psychol Sport Exerc 2006;7:555-75.
8. ASP (Association of Surfing Professionals). ASP Rule Book 2010: Coolangatta, 2010. Available from: <http://www.aspworldtour.com/2009/pdf/asprulebook.pdf> [2010 Mar 25].
9. Hang Loose. 2007. Available from: <http://www.hangloose.com.br/hangloosepro/2007/index_pt.html> [2007 Dec 01].
10. ASP World Tour. ASP World Tour. 2010. Available from:<http://www.aspworldtour.com/brazil/> [2010 Apr 29].
11. *Mendez-Villanueva A, Bishop D,* Hamer P. Activity Profile of World-Class Professional Surfers During Competition: A Case Study. J Strength Cond Res 2006;20(3):477-82.
12. Everline C. Shortboard Performance Surfing: A Qualitative Assessment of Maneuvers and a Sample Periodized Strength and Conditioning Program In and Out of the Water. Strength Cond J 2007;29(3):32-40.
13. Frank M, Zhou S, Bezerra P, Crowley Z. Effects of long-term recreational surfing on control of force and posture in older surfers: a preliminary investigation. J Exerci Sci Fitness 2009;7(1):31-8.
14. Chapman DW, Needham KJ, Allison GT, Lay B, Edwards DJ. Effects of experience within a dynamic environment on postural control. Br J Sports Med 2007;42(1):16-21.
15. Scarfe BE, Elwany MHS, Mead ST, Black KP. The Science of Surfing Waves and Surfing Breaks - A Review. Proceedings of the 3rd International Surfing Reef Symposium. Raglan (New Zealand): 2003, p.37-59.
16. Moreira MAAG. Matriz de análise das tarefas desportivas: Sistema de classificação estrutural - Modelo taxinómico do Surf. [Tese de Doutorado - Faculdade de Motricidade Humana]. Lisboa (Portugal): Universidade Técnica de Lisboa; 2007.

17. Palmeira MV. Influência do sistema nervoso autônomo nas alterações cardiovasculares e metabólicas de surfistas profissionais. [Dissertação de Mestrado - Pós-Graduação em Educação Física]. São Paulo (SP): Universidade São Judas Tadeu; 2007.

Corresponding author

Saray Giovana dos Santos
Universidade Federal de Santa Catarina
Centro de Despostos
Programa de Pós-Graduação em Educação Física.
88040-900 – Florianópolis, SC. Brasil
E-mail: saray@cds.ufsc.br